Network Usage Analysis System And Method For
Updating Statistical Models
Inventor: N. Lee Rhodes
HP Docket No.: 10013111-1
Contact: William J. Streeter; (970) 898-3886

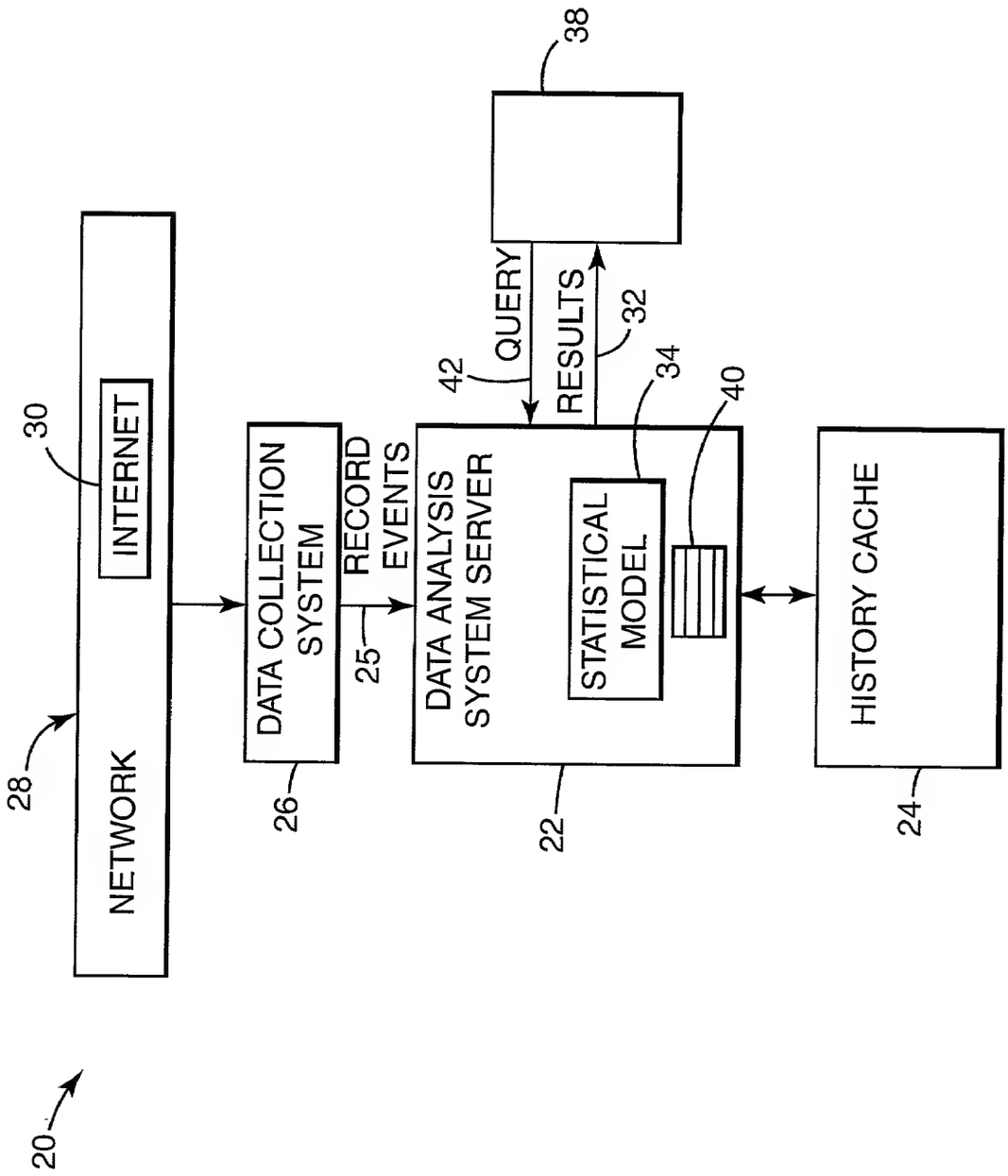

Fig. 1

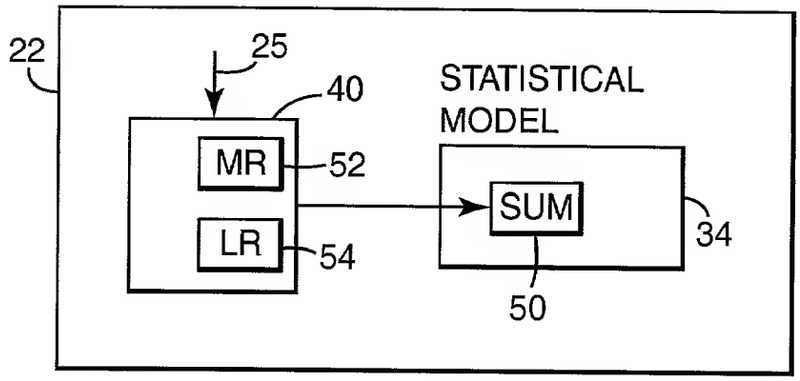
22
25
40
STATISTICAL
MODEL
MR
52
LR
54
SUM
34
50

Fig. 2

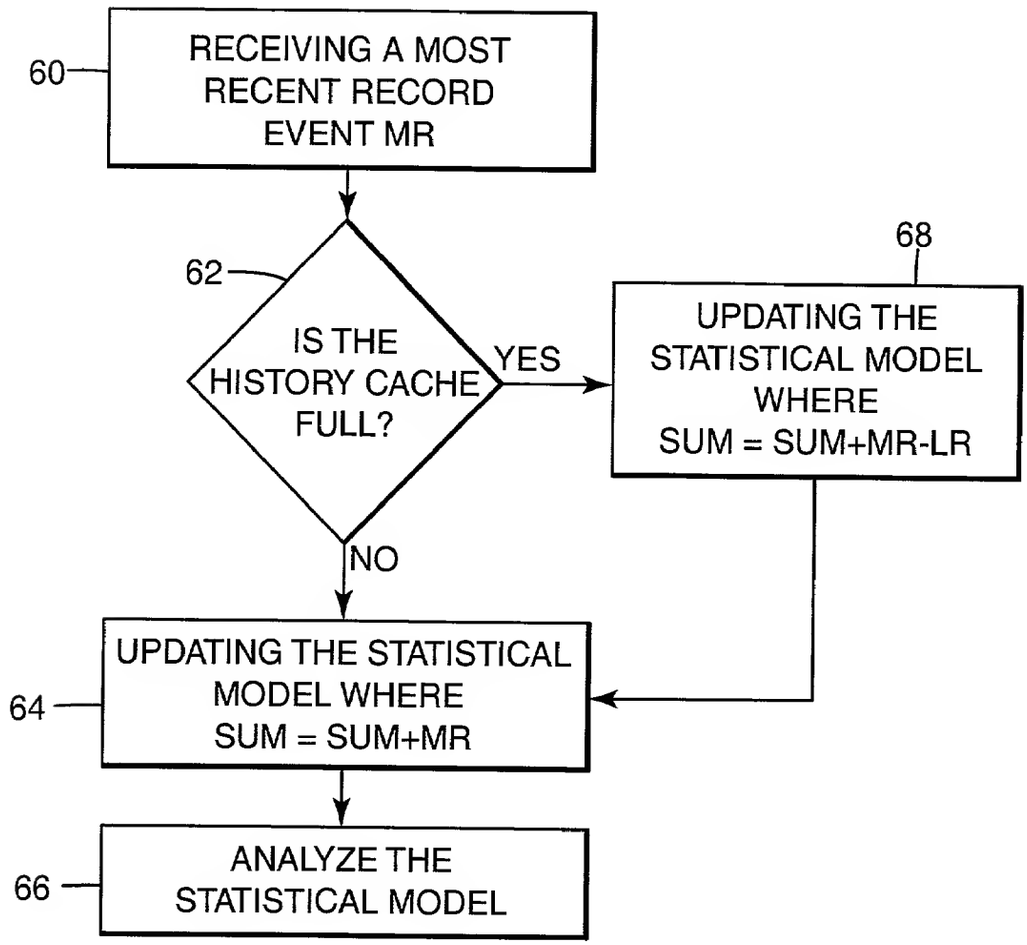
60
RECEIVING A MOST
RECENT RECORD
EVENT MR
62
IS THE
HISTORY CACHE
FULL?
YES
68
UPDATING THE
STATISTICAL MODEL
WHERE
SUM = SUM+MR-LR
NO
64
UPDATING THE STATISTICAL
MODEL WHERE
SUM = SUM+MR
66
ANALYZE THE
STATISTICAL MODEL

Fig. 3

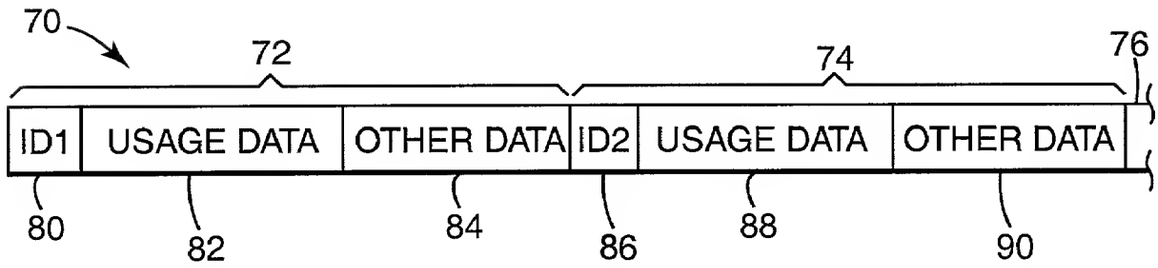
70
72
74
76
ID1
USAGE DATA
OTHER DATA
ID2
USAGE DATA
OTHER DATA
80
82
84
86
88
90

Fig. 4

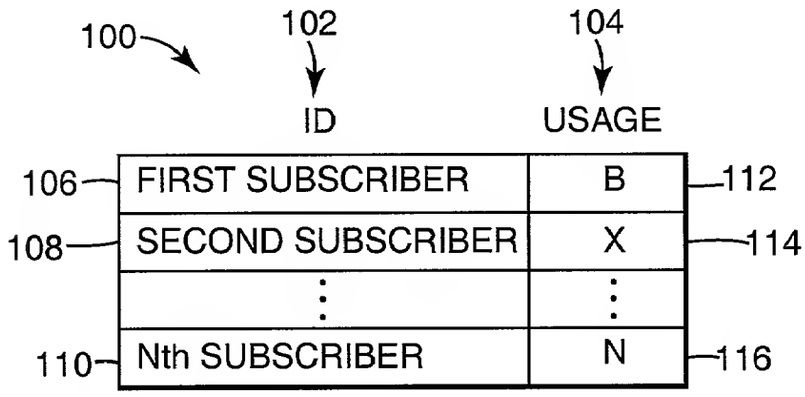
100
102
ID
104
USAGE
106
FIRST SUBSCRIBER
B
112
108
SECOND SUBSCRIBER
X
114
110
Nth SUBSCRIBER
N
116

Fig. 5

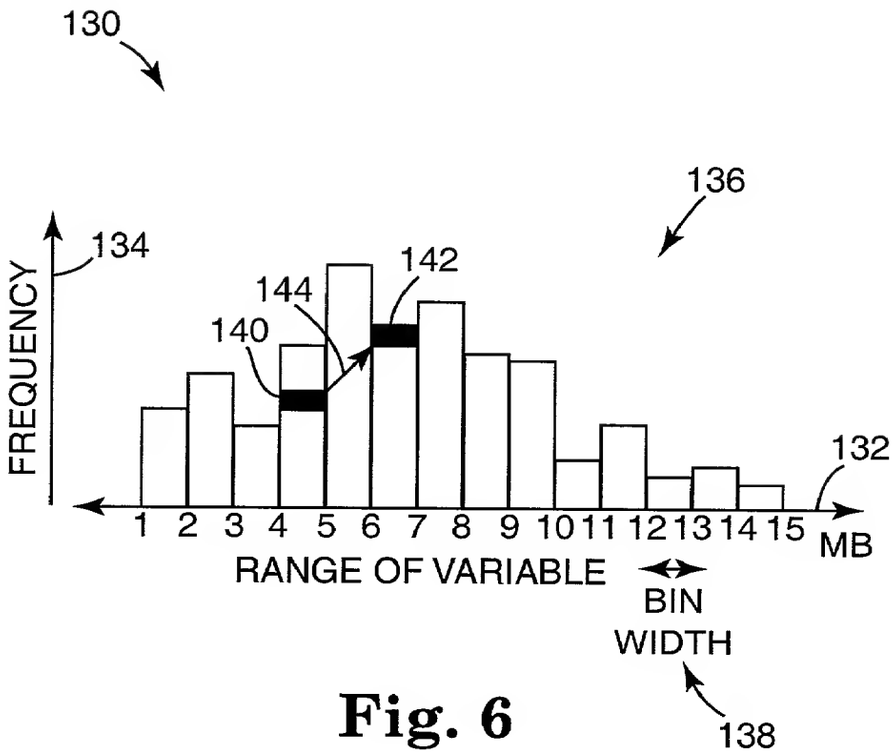
130
136
134
142
144
140
FREQUENCY
132
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MB
RANGE OF VARIABLE
BIN
WIDTH
138

Fig. 6

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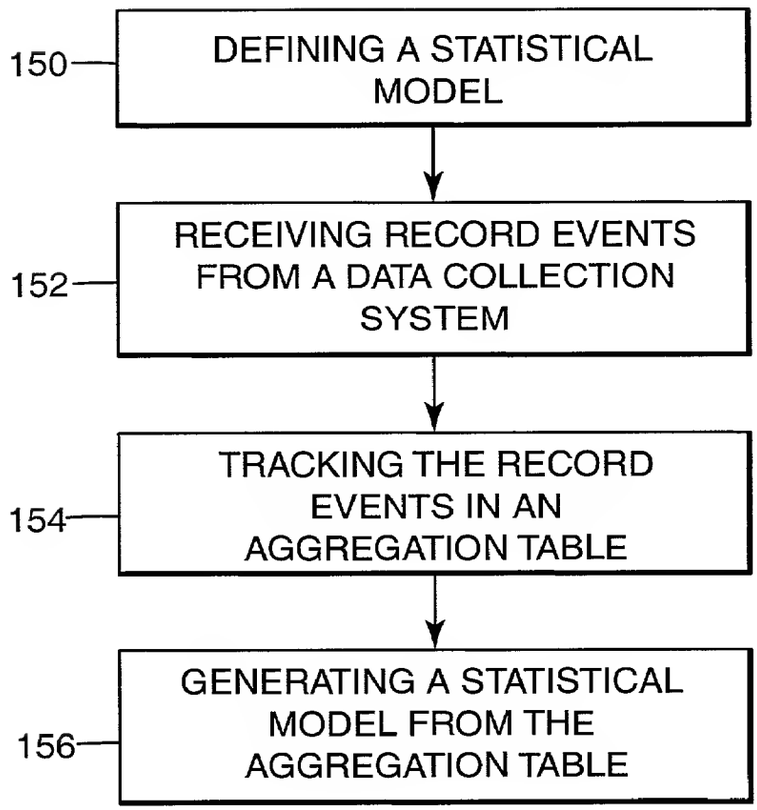
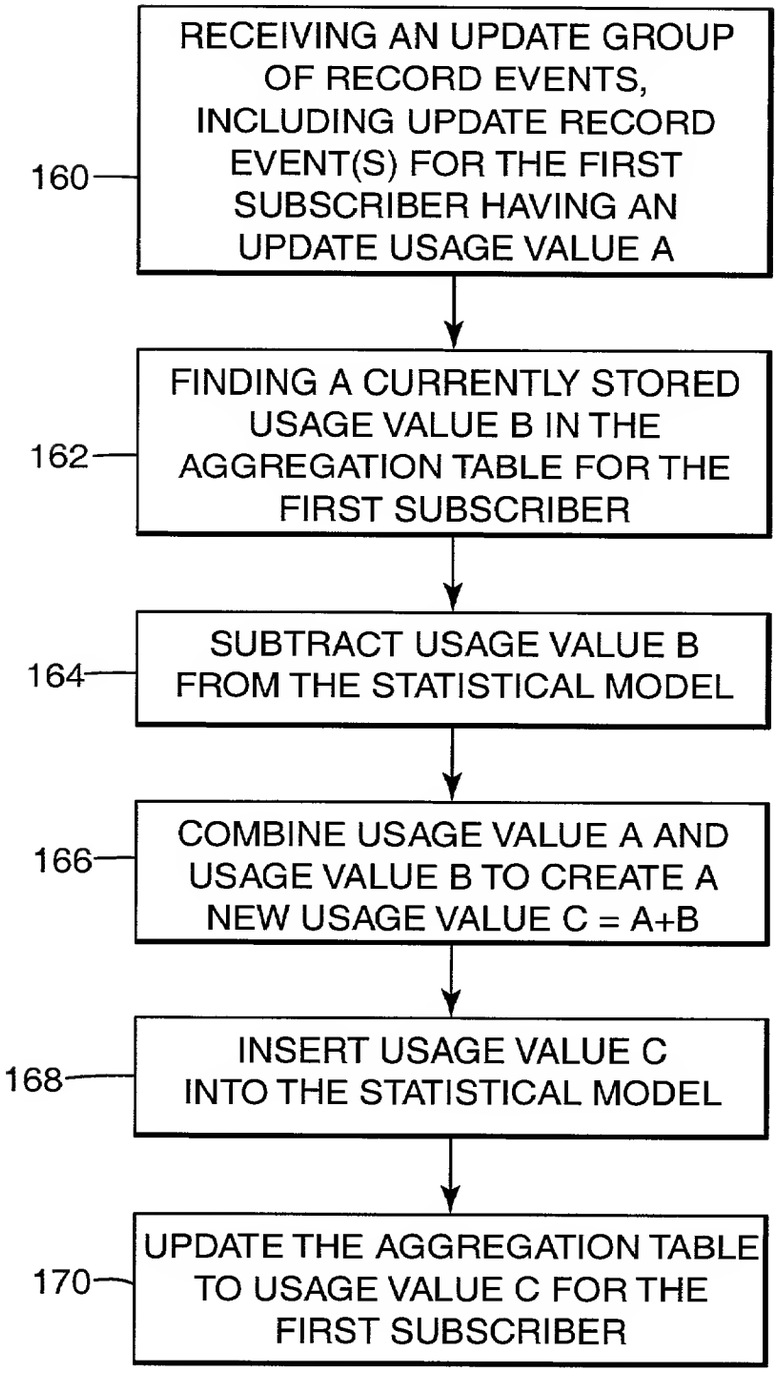


Fig. 7


RECEIVING AN UPDATE GROUP OF RECORD EVENTS, INCLUDING UPDATE RECORD EVENT(S) FOR THE FIRST SUBSCRIBER HAVING AN UPDATE USAGE VALUE A
160
FINDING A CURRENTLY STORED USAGE VALUE B IN THE AGGREGATION TABLE FOR THE FIRST SUBSCRIBER
162
SUBTRACT USAGE VALUE B FROM THE STATISTICAL MODEL
164
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166
INSERT USAGE VALUE C INTO THE STATISTICAL MODEL
168
UPDATE THE AGGREGATION TABLE TO USAGE VALUE C FOR THE FIRST SUBSCRIBER
170

Fig. 8

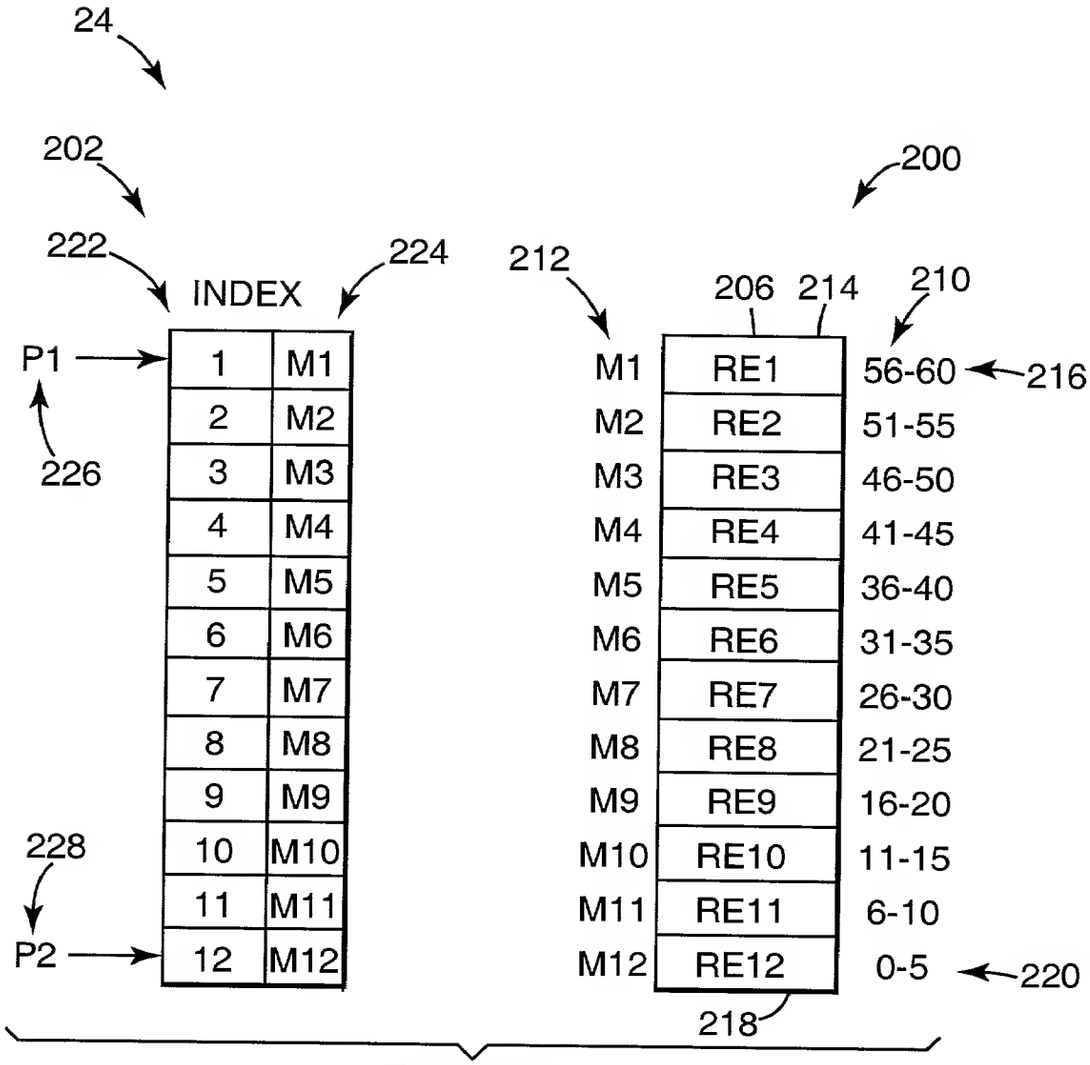
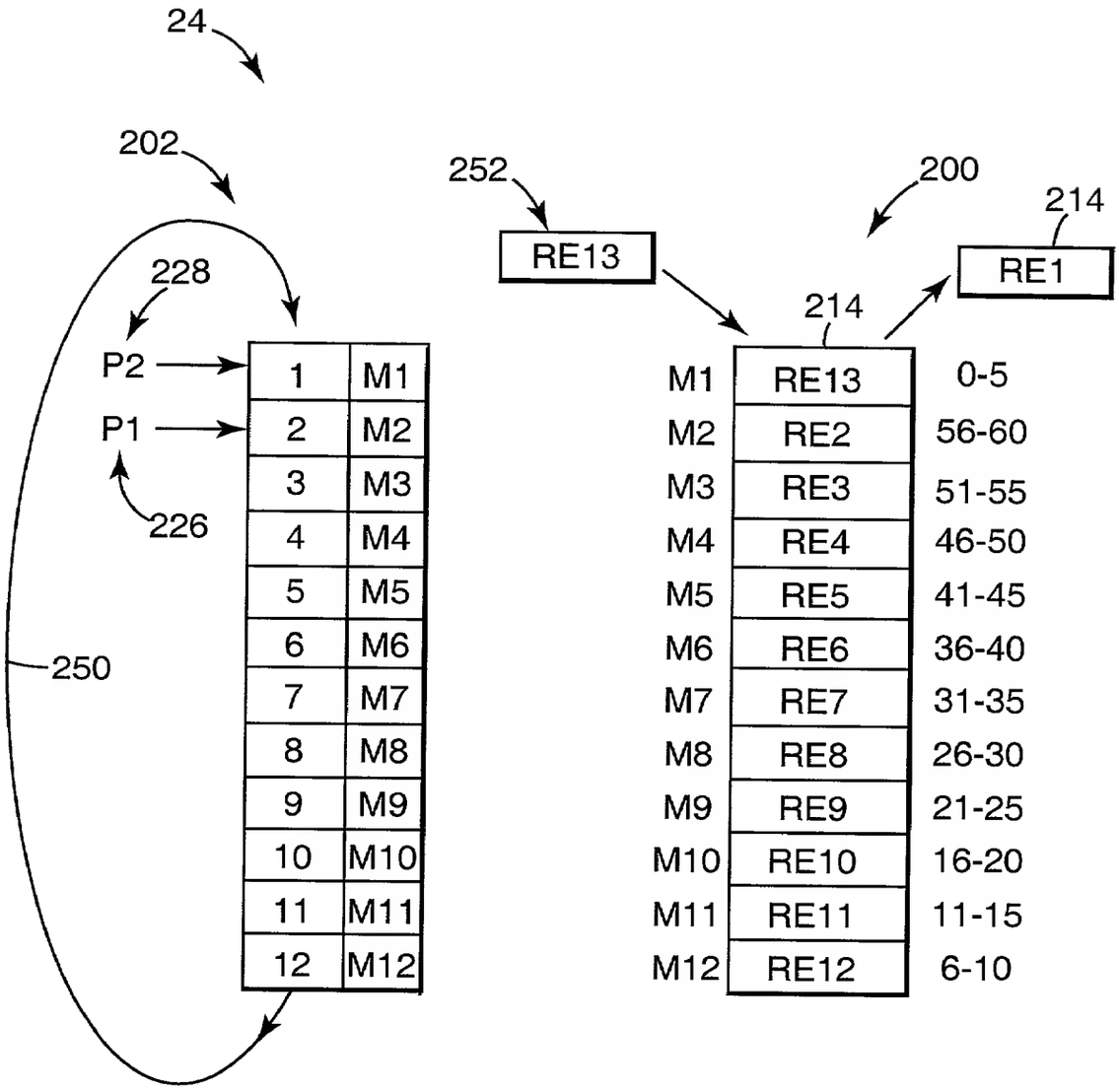

24
202
200
222
224
212
INDEX
206
214
210
P1
1
M1
M1
RE1
56-60
216
2
M2
M2
RE2
51-55
226
3
M3
M3
RE3
46-50
4
M4
M4
RE4
41-45
5
M5
M5
RE5
36-40
6
M6
M6
RE6
31-35
7
M7
M7
RE7
26-30
8
M8
M8
RE8
21-25
9
M9
M9
RE9
16-20
228
10
M10
M10
RE10
11-15
11
M11
M11
RE11
6-10
P2
12
M12
M12
RE12
0-5
220
218

Fig. 9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202
252
200
214
RE13
RE1
228
214
P2
P1
226
250
1 M1
2 M2
3 M3
4 M4
5 M5
6 M6
7 M7
8 M8
9 M9
10 M10
11 M11
12 M12
M1 RE13 0-5
M2 RE2 56-60
M3 RE3 51-55
M4 RE4 46-50
M5 RE5 41-45
M6 RE6 36-40
M7 RE7 31-35
M8 RE8 26-30
M9 RE9 21-25
M10 RE10 16-20
M11 RE11 11-15
M12 RE12 6-10

Fig. 10

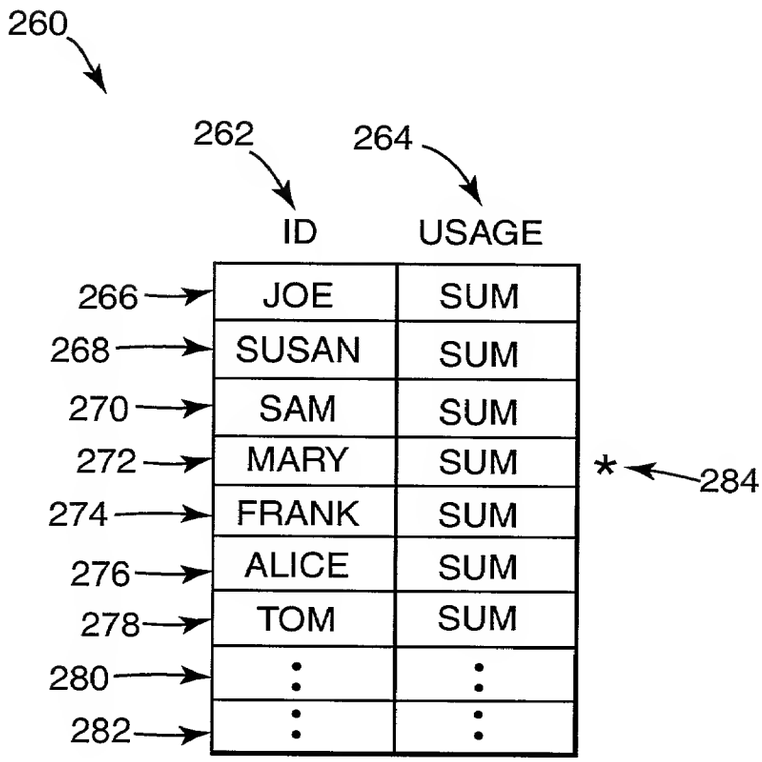

260
262
264
ID
USAGE
266
JOE
SUM
268
SUSAN
SUM
270
SAM
SUM
272
MARY
SUM
*
284
274
FRANK
SUM
276
ALICE
SUM
278
TOM
SUM
280
282

Fig. 11

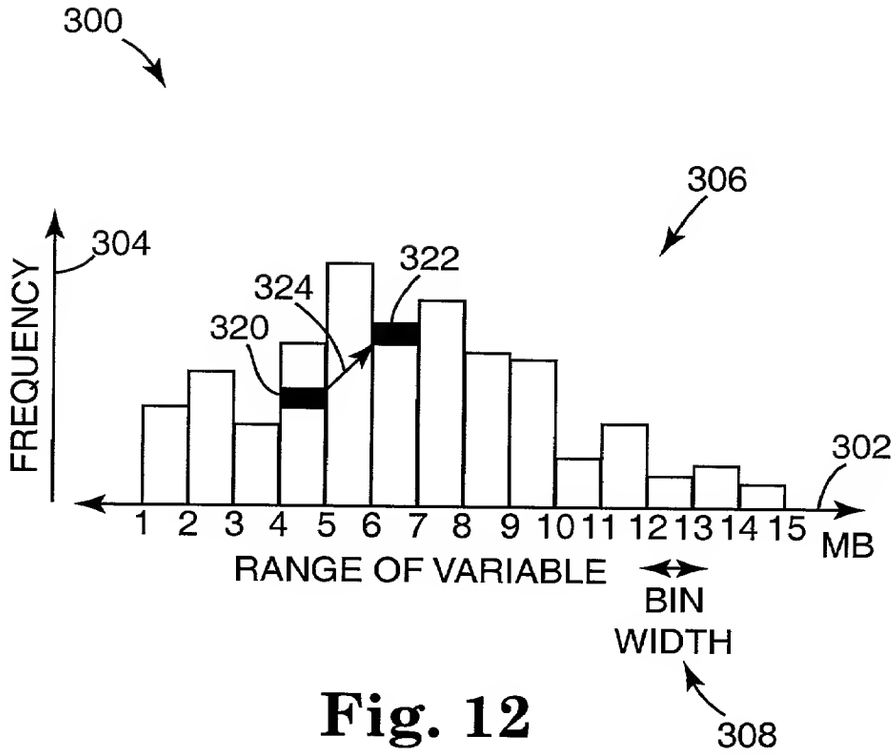
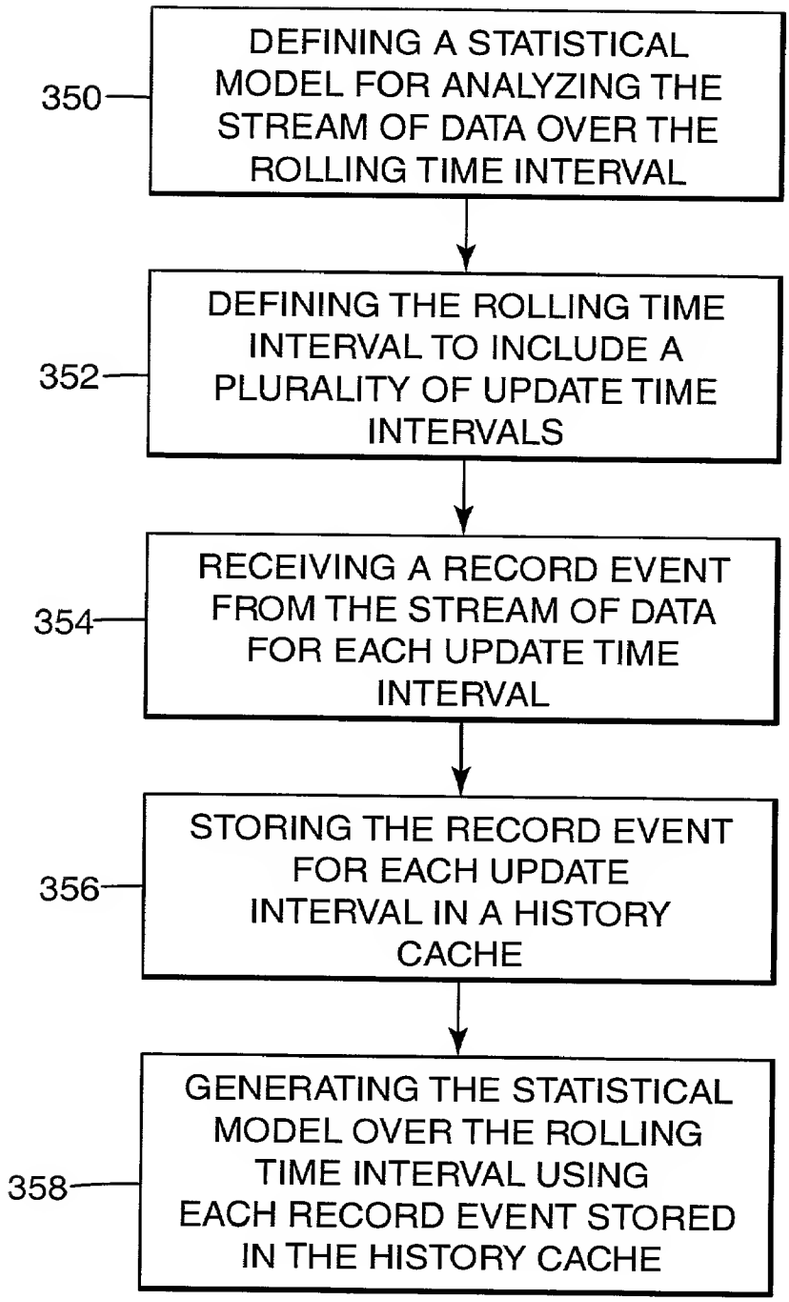

300
306
304
322
324
320
FREQUENCY
302
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MB
RANGE OF VARIABLE
BIN
WIDTH
308

Fig. 12


350
DEFINING A STATISTICAL MODEL FOR ANALYZING THE STREAM OF DATA OVER THE ROLLING TIME INTERVAL
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354
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356
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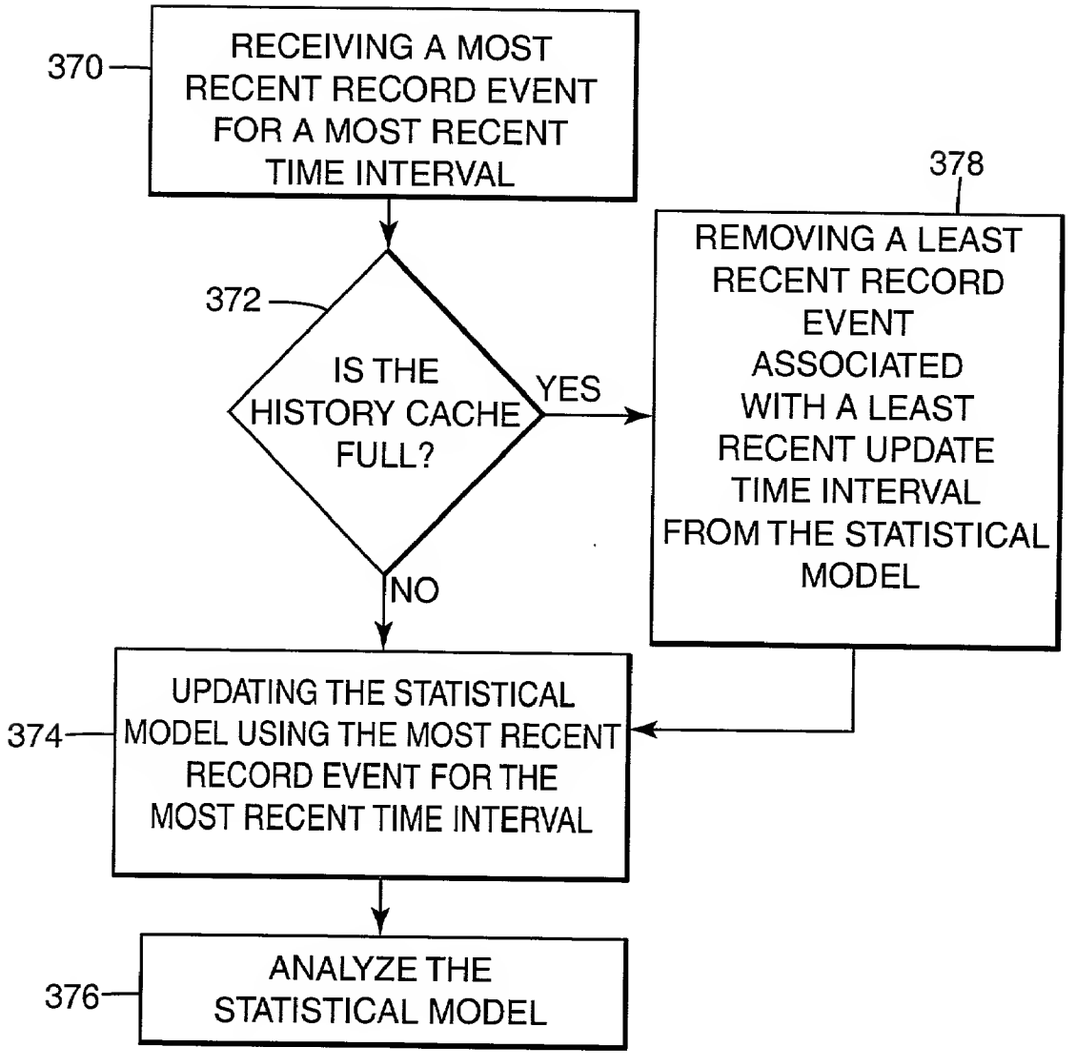
358
GENERATING THE STATISTICAL MODEL OVER THE ROLLING TIME INTERVAL USING EACH RECORD EVENT STORED IN THE HISTORY CACHE

Fig. 13


370
RECEIVING A MOST RECENT RECORD EVENT FOR A MOST RECENT TIME INTERVAL
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IS THE HISTORY CACHE FULL?
YES
NO
378
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374
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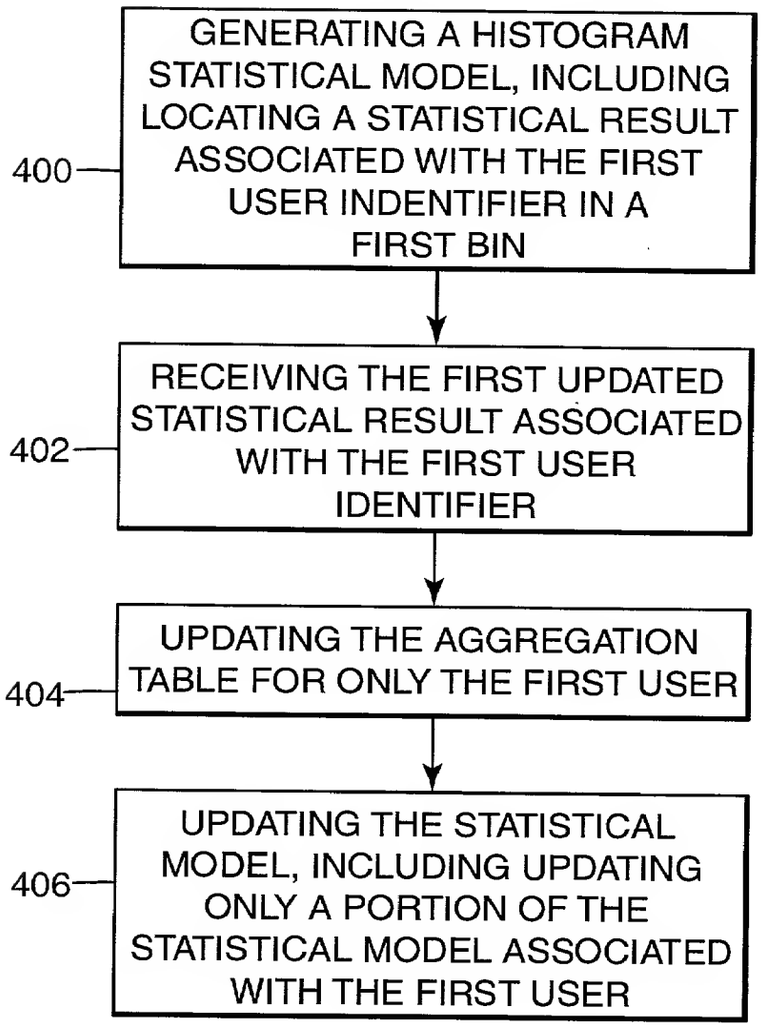
376
ANALYZE THE STATISTICAL MODEL

Fig. 14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400
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406

Fig. 15